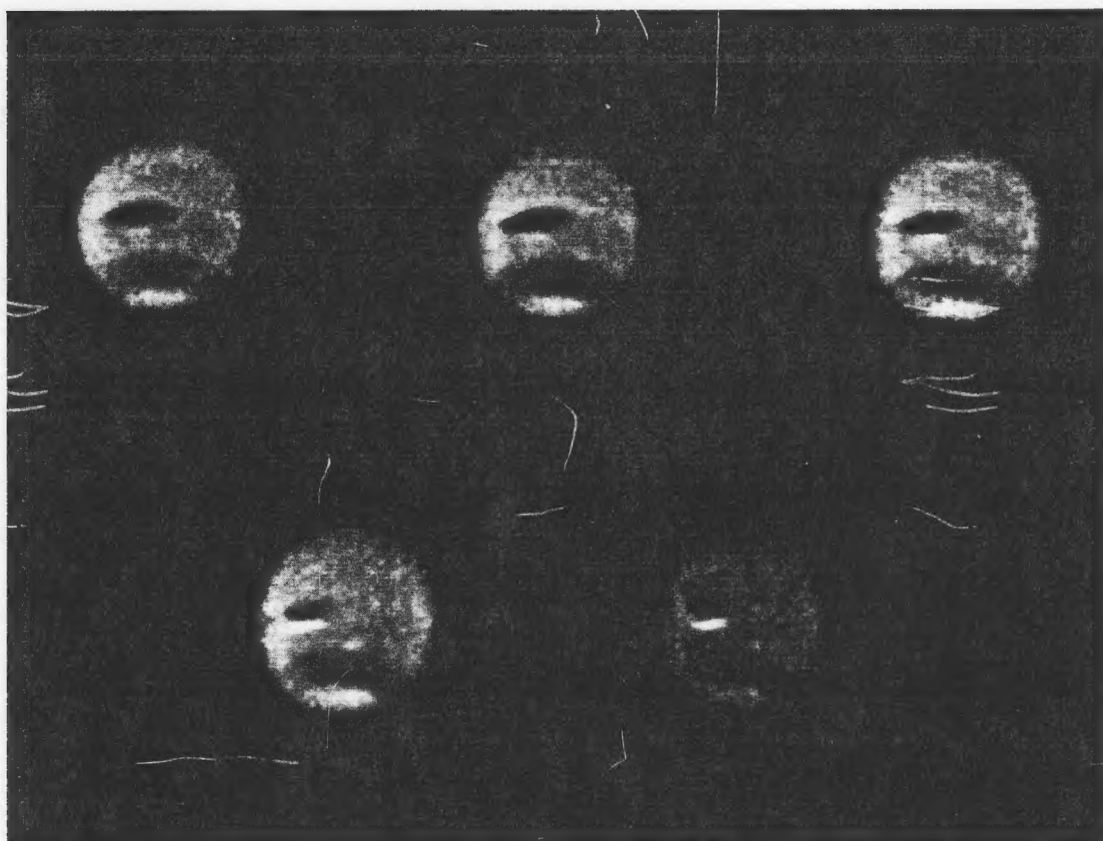


Voyager

B U L L E T I N

MISSION STATUS REPORT NO. 87

JUNE 15, 1989



Neptune's appearance differs markedly in images taken through colored filters. (Top row: violet, blue, unfiltered. Bottom row: green, orange). (P-34322)

Dynamic Neptune

Three months before Voyager 2's closest approach to Neptune, the spacecraft is returning images of the planet that show an unexpectedly dynamic atmosphere on the eighth planet from the Sun. A recently released set of five images, taken on May 24 when the spacecraft was 134 million kilometers (83 million

miles) from the planet, shows the large dark spot, smaller white spot, atmospheric banding, and brightening at the south pole seen in earlier images. The images were taken through five different filters on Voyager 2's narrow-angle camera. The planet's appearance differs markedly as it is photographed in different colors, probably because of differences in colors of specific cloud fea-

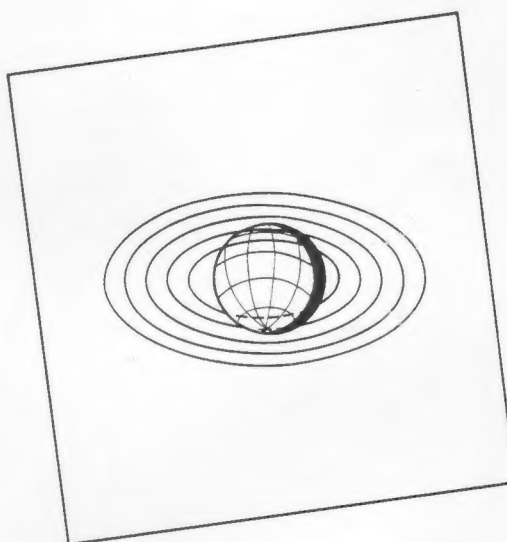
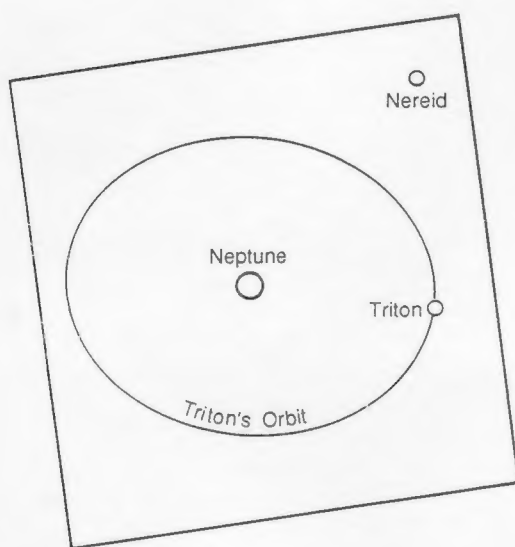
tures and the effects of hazes. Bright features are more visible in green and orange light, while darker features show more contrast in violet and blue light. The degree of dynamic activity was unexpected in Neptune's atmosphere because Neptune receives only one-tenth of one percent as much solar energy as does Earth.

Observatory Phase Begins

The 62-day Observatory phase of the Neptune encounter began on June 5 and will continue until the Far Encounter phase begins on August 6. Three command loads will operate Voyager 2 during the Observatory period. Tracking coverage will be increased to 24 hours a day, and Voyager 2 will begin repetitious observations

of the Neptune system, including ultraviolet scans to search for neutral hydrogen and excited ions. The imaging cameras will be trained on the planet to study atmospheric dynamics as Voyager 2 approaches Neptune. In addition, engineering calibrations and checks will be performed. On June 8, engineers performed a test to monitor the performance of the azimuth actuator on the scan platform. On June 12, the

antenna and sun sensor were calibrated. On June 15, the spacecraft will perform four yaw turns and four roll turns to calibrate the magnetometer sensors and will then calibrate the alignment of the boom on which the sensors are mounted. A radio science operational readiness test will be conducted on June 28, and a trajectory correction will take place on August 1.



From the first image of the Observatory phase to the last, Neptune will steadily grow in the field of view (7.5 x 7.5 milliradians) of Voyager 2's narrow-angle camera.

Soviet Scientists Named to Voyager Teams

Three Soviet scientists have been invited to become Voyager Interdisciplinary Scientists. The scientists, their institutions, and their areas of expertise are: Dr. Alexandre T. Bazilovski, Vernadsky Institute for Cosmochemistry, Moscow, (solid surfaces); Dr. Vladimir A. Krasnopolsky, Institute for Space Research, (atmospheres); and Dr. Lev M. Zelenyi, Institute for Space Research, (magnetospheres).

The three scientists will spend about a month at JPL, centered around Voyager 2's close approach to Neptune in August 1989.

The participation of Interdisciplinary Scientists in planetary programs is not limited to their recognized areas of scientific expertise. They share equally in the scientific and supporting data needed to carry out their scientific studies, have rights of authorship on published papers to which they contribute, and are bound by established policies regarding individual publications and proprietary rights to data. (By

contract, NASA-funded scientists have proprietary rights to their data for one year after its receipt.)

The Soviet scientists' involvement grew out of the U.S./U.S.S.R. Joint Working Group on Solar System Exploration, which has worked out agreements for cross-participation in U.S. and Soviet solar system exploration programs.

The Voyager science teams include about 150 scientists from the U.S., Canada, Great Britain, France, West Germany, and Italy who work on Voyager's eleven scientific investigations.

Near Encounter Test Completed

With the successful completion of the Near-Encounter Test (NET) on May 24-25, the Voyager Flight Team has completed its test and training period and is ready to begin the Neptune encounter, which officially started on June 5, 1989, 81 days before Voyager 2's closest approach to Neptune.

According to Doug Griffith, Voyager Encounter Preparations Manager, the NET was "99 percent like the real encounter" in terms of what the spacecraft was doing.

"The NET was a high-fidelity execution of the most active 12 hours of sequences on the spacecraft," he explained. The NET was a slice of the 53-hour Near Encounter phase, during which the highest value science will be gathered next August 24-25.

Tracking support was provided by the Very Large Array/Goldstone Telemetry Array in North America, the Parkes/Canberra Telemetry Array in Australia, and the Usuda tracking station in Japan. (Because Voyager 2 is in the southern hemisphere as seen from Earth, the highest value encounter data will be received when the spacecraft is "over" Australia.)

For the NET, Voyager 2 was programmed to perform all spacecraft motions that could be performed without pointing sensitive instruments toward the bright Sun, including five of eight medium-rate (0.33 degrees/second) slews of the platform on which the optical instruments are mounted, image motion compensation, nodding image motion compensation, maneuverless image motion compensation, spacecraft roll maneuvers to new reference stars, and the radio science limbtracking maneuver. The

limbtracking maneuver in the NET was part of a radio science operational readiness test.

"All objectives of the NET were met with the exception of some problems in obtaining all the ground-based radio science data. These objectives will be retested in late June and early August," Mr. Griffith summarized.

NASA Select TV to Feature Voyager 2 Neptune Images

Beginning Tuesday, June 13, at noon EDT, a selection from the previous week's images of Neptune from the Voyager 2 spacecraft will be broadcast on the NASA Select TV system, which uses Satcom F2R, transponder 13, every Tuesday through August 8. NASA Select TV is available only in the contiguous United States since the Satcom satellite is in geosynchronous orbit over North America.

The broadcast of the images is expected to last about 1 hour and will show a replay of the first-order reconstruction of Voyager 2's imaging system views of Neptune. At the time of the first image in the first

broadcast, Voyager 2 was nearly 2-2/3 billion miles from Earth and approximately 71 million miles from Neptune.

On June 5, the Voyager 2 spacecraft went into the Observatory phase mode. In this mode the spacecraft begins a series of imaging observations of Neptune from afar. Five images are taken every 3 hours, 34.4 minutes (one-fifth of Neptune's estimated rotation period). Voyager planetary scientists will use these images to help study the Neptune atmosphere, already seen to be more turbulent than that of Uranus and possessing what appear to be variable "white" spots, covering portions of whole hemispheres. The spots come and go with relative rapidity. Dr. Brad Smith, University of Arizona, said, "Neptune is now more interesting than Uranus was even at close encounter." Dr. Smith is the Voyager Imaging Team leader.

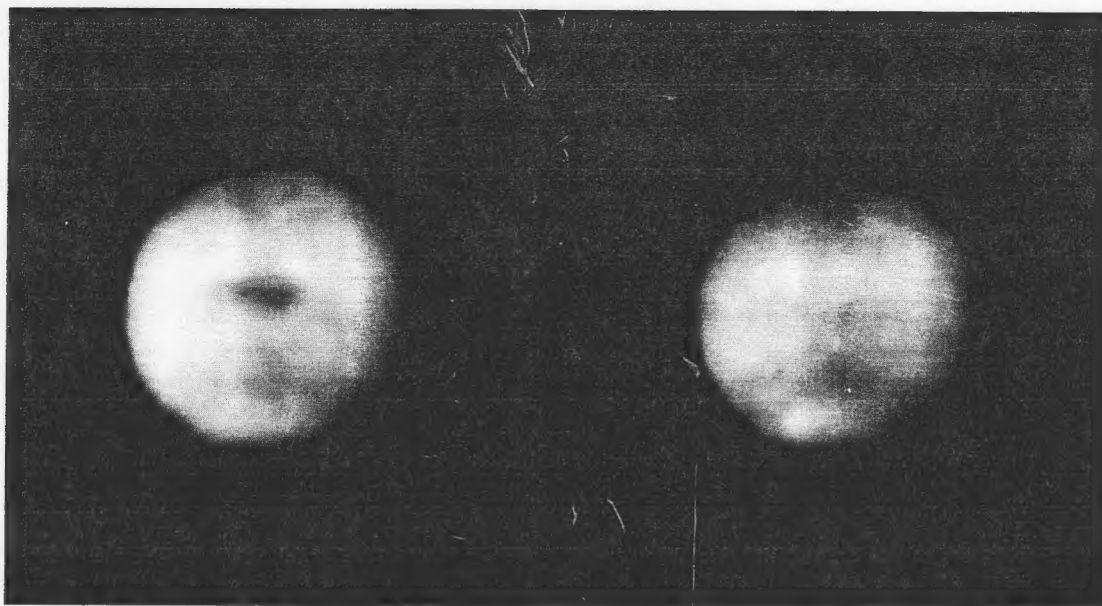
The timetable for NASA Select replay of Voyager 2 images, along with the distance remaining to Neptune and the distance from Earth, is given below.

The images to be replayed on NASA Select will include both

Voyager's 2 Distance at Start of Each Broadcast

Broadcast Date	to Neptune (million miles)	from Earth (billion miles)
June 13	70.70	2.65
June 20	64.40	2.65
June 27	59.00	2.66
July 4*	53.73	2.66
July 11	48.30	2.66
July 18	42.88	2.67
July 25	37.45	2.68
August 1	32.03	2.69
August 8	26.60	2.70

*This date may move later in the week due to holiday observance.



A white spot (seen in right image) near Neptune's south pole was only faintly visible in images taken only 18 hours earlier. These two images were taken about five hours (100 degrees longitude) apart on April 26, 1989. (P-34255)

the actual image of Neptune as seen by Voyager and engineering and science information about the conditions of the imaging system and lighting. This data will appear alongside each image of retransmissions but will be removed in later, more processed views. Early transmissions will not show a great amount of detail and the planet will occupy only a small portion of the imaging frame. Detail will improve dramatically as the spacecraft nears Neptune.

One-way light and radio transmission times between the Voyager 2 spacecraft and the NASA Deep Space Network receiver facilities at Madrid, Canberra and Goldstone, California, range from 3 hours, 57 minutes now to an expected 4 hours, 6

minutes at the closest approach. It takes over 8 hours for commands, sent from JPL's Space Flight Operations Facility, Pasadena, to reach the Voyager 2 spacecraft and be verified and sent back to Earth.

Because the JPL facilities associated with the Voyager project are not completely geared up for the close encounter activity, these views will be released in video format via satellite only. There will be no capability to release individual still photos for the complete video series. Current expectations, though, include the capability to release, on a periodic basis, a set of hard copy views which have received the benefit of further computer enhancement. JPL's complete computer processing capabilities will be up and running, though,

for the encounter period from August 21 through 29. The Post-encounter phase runs from August 29 through October 2, at which time Voyager 2 will return to interplanetary cruise mode.

NASA will operate a full-time Voyager encounter news facility at JPL's von Karman Auditorium from August 21 through 29. Special programming from JPL will be broadcast over NASA Select during this period, and planetariums, schools, museums, and observatories who can receive NASA Select TV are encouraged to open their auditoriums to the public to view the Neptune encounter activities.

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